INFLUENCE OF MICROALLOYING WITH ADDITIONAL ELEMENTS ON STRUCTURE AND PROPERTIES OF AS-CAST TI-AL-SI-ZR HYPOEUTECTIC ALLOYS

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Microstructural modification is one of the common ways to increase room temperature (RT) ductility of the as-cast eutectic Ti-Al-Si-Zr alloys, which are prospective high-temperature structural natural composite materials [1-2]. In the current work such microstructural modifying elements as B, La, Y, Ce, Sc, Ga, and Bi were selected to refine microstructure of the as-cast Ti-3Al-6Si-5Zr (wt.%) alloy.

Light and scanning electron microscopy methods, were used to study microstructure, and measurements of Vickers hardness, bending and tensile tests were carried out to evaluate mechanical properties.

Small additions of selected modifying elements were found to lead in structural change of the as-cast state resulting in refinement of both primary beta-Ti dendrites and eutectic colonies. Optimal microalloying with 0.08 Bi, 0.08 Sc, 0.5 Ga, and 0.2 Ce results in increase of RT plasticity in two times. At the same time such a microalloying does not change substantially strength in temperature range of 600-800 ^{0}C. Alloying of Ti-3Al-6Si-5Zr alloy with 0.08Bi results in decrease of strength and significant growth of plasticity at 700 and 800 ^{0}C.

It is concluded that optimization of the amount and combination of the modifying elements is required to achieve better refinement of the microstructure and better properties combination of the as-cast alloy.

1. S. Firstov. In: Advanced Multilayered and Fibre-Reinforced Composites, Ed. by Y.M. Haddad, NATO ASI Series 3, High Technology, V.43, 1998,p.175-186.

2. S.A. Firstov, Yu.N. Taran, V.I. Masur et al. Metal i litje Ukrainy, 1999, N11-12, p.42-46 (In Russian).